Hybrid Physical-Chemical Vapor Deposition of MgB_2 Thin Films

Xiaoxing Xi and Joan Redwing, Penn State University

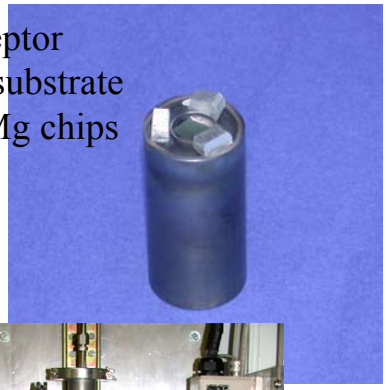
DMR-0306746

Superconducting generators, motors, magnets, and integrated circuits for high-performance A/D converters and petaflop computers based on MgB_2 and operating at about 25 K will have a large impact on the society.

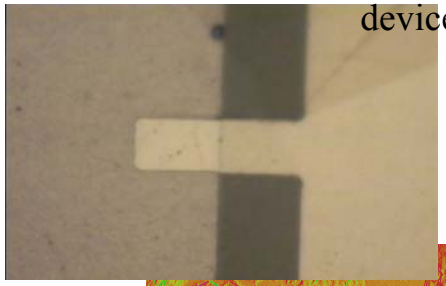
The breakthrough in the *in situ* deposition of epitaxial MgB_2 films by the innovative HPCVD technique paves the way for superconducting integrated circuits. The cleanness of the films and the ability to make films dirty in a controlled manner enables fundamental research into the two-band effects of MgB_2.

The ``Penn State" films have become the standard for high quality MgB_2 thin films in the community.

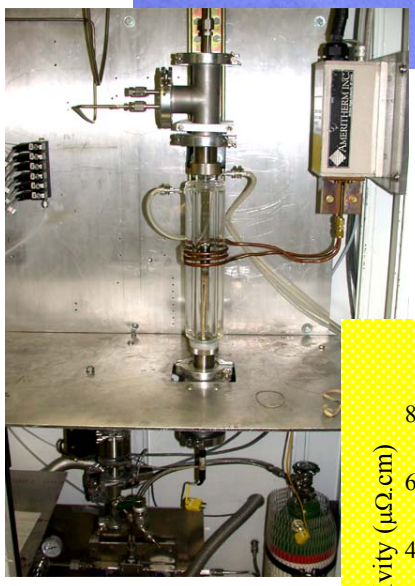
(Click for news articles on our work.)



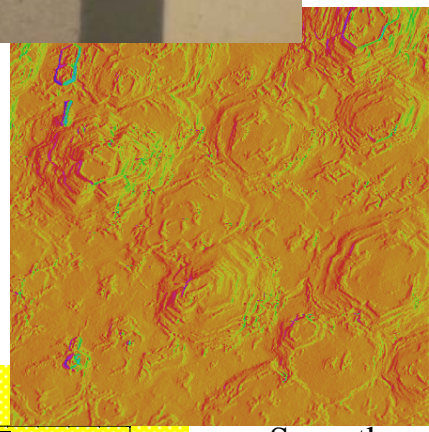
Susceptor with substrate and Mg chips



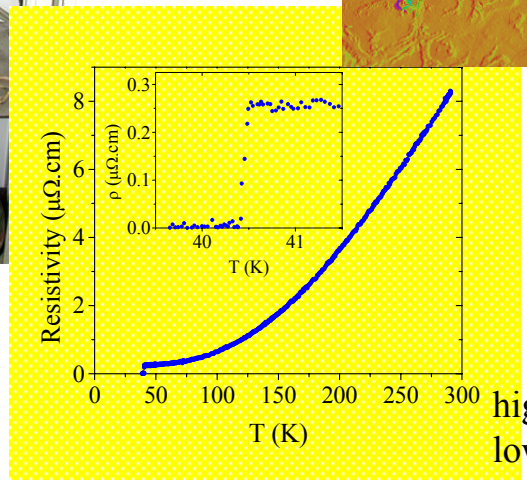
Josephson devices



HPCVD setup



Smooth surface



high T_c and low resistivity

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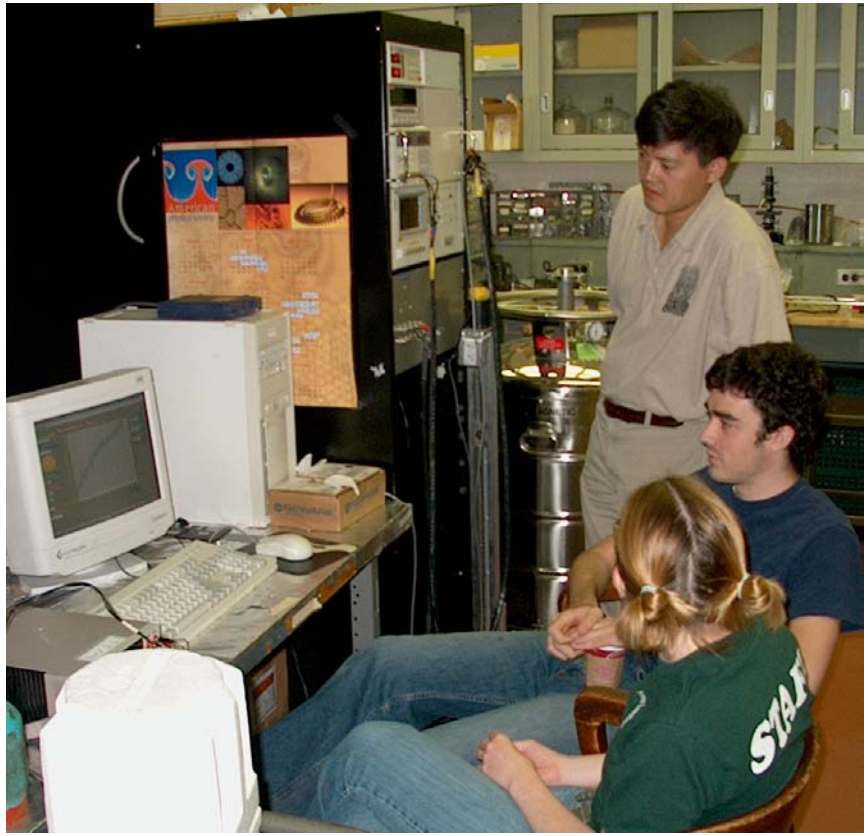
Education:

Since the beginning of the project in the summer, two undergraduate students (Amber Beckley and Rory Donovan), one graduate student (Yi Cui), and one visiting scholar (Alexej Pogrebnyakov) contributed to this work. Amber and Roy worked on the degradation of MgB_2 films in water as participants of the REU program at Penn State.



Picture: The PI (standing) watched as Amber and Roy measured resistivity of a MgB_2 film as a function of time when it was immersed in 0°C water.